

Pickup design for arrival-time measurements at REGAE

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Laser wakefield accelerators are capable of accelerating electron bunches to energies on the GeV scale over acceleration distances of only a few cm. However, the beam quality still can be improved especially in terms of energy spread and emittance. In order to gain more insight into the acceleration process, the high-quality electron bunches produced by the conventional accelerator REGAE at DESY are planned to be injected into a laser driven wakefield. The timing between driving laser and probing bunch is of utmost importance since the wakefield structure is typically on the order of a few 100 fs. Several measurement techniques are available for measuring the arrival-time of the electron beam with fs resolution. Based on the detection scheme (resonant or broadband), different pickup structures can be used (cavities, striplines, buttons). As the bunch charge in this case is as low as 100 fC, the selection of the detection scheme and with that the selection of the pickups is extremely challenging. Namely, such a low charge of the beam induces a very low voltage levels in the pickups. The selected pickup structures need to be optimized in order to maximize the induced voltage levels in the pickups.

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